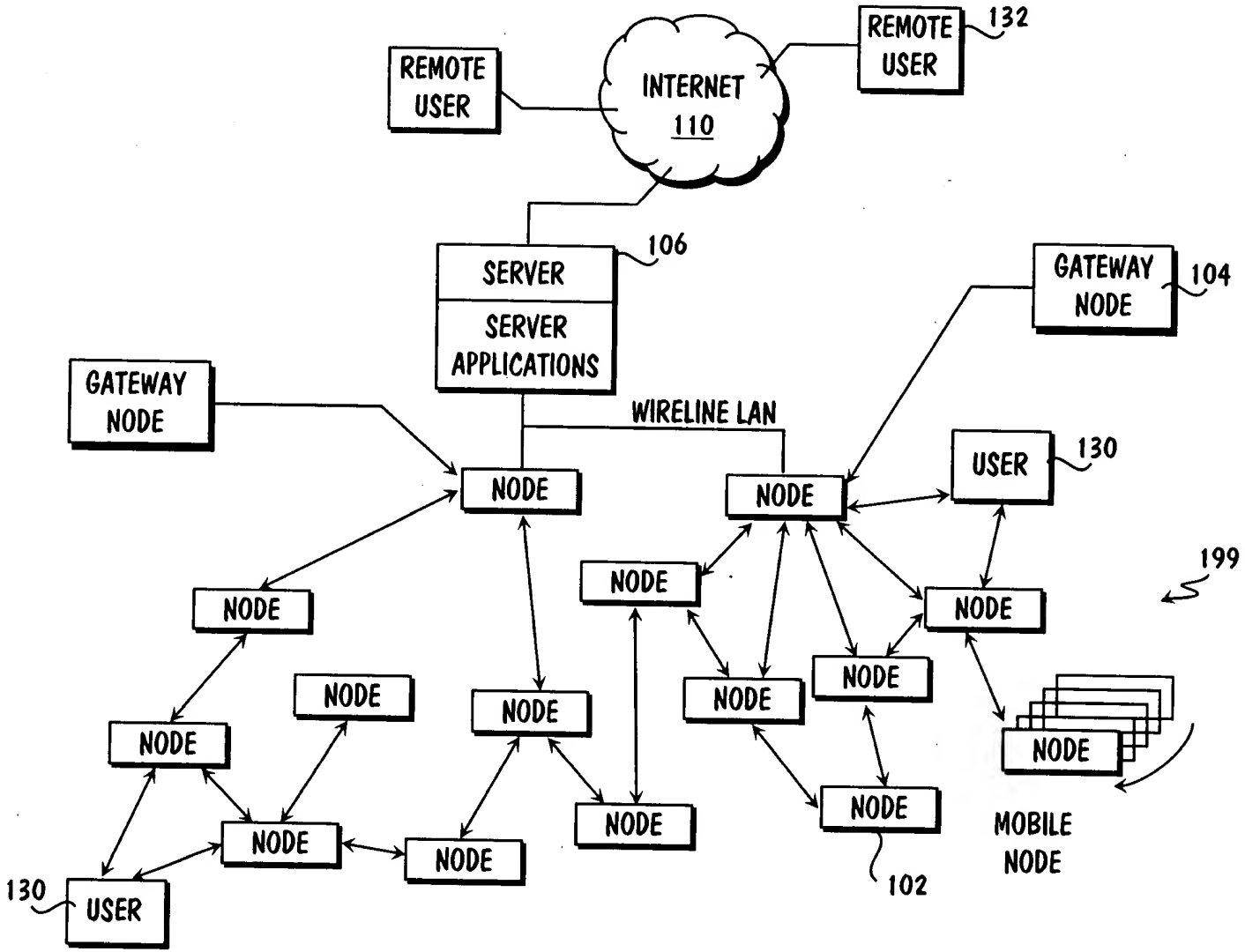

REMOTE USER
INTERNET 110
REMOTE USER
132
SERVER
SERVER APPLICATIONS
106
GATEWAY NODE
104
GATEWAY NODE
WIRELINE LAN
NODE
NODE
USER
130
199
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
NODE
MOBILE NODE
102
130
USER

FIG. 1

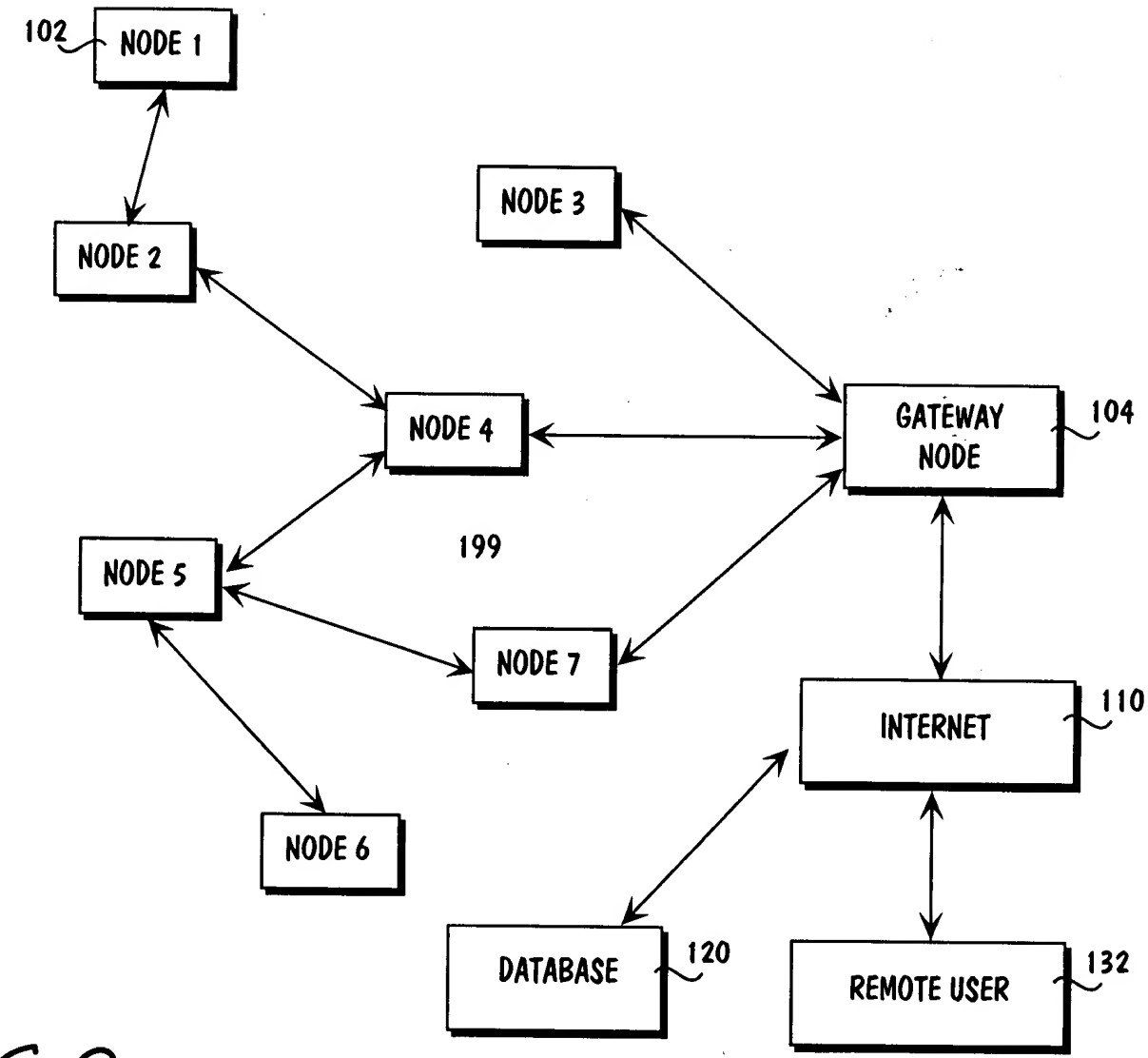

102
NODE 1
NODE 2
NODE 3
NODE 4
GATEWAY NODE
104
199
NODE 5
NODE 7
INTERNET
110
NODE 6
DATABASE
120
REMOTE USER
132

FIG. 2

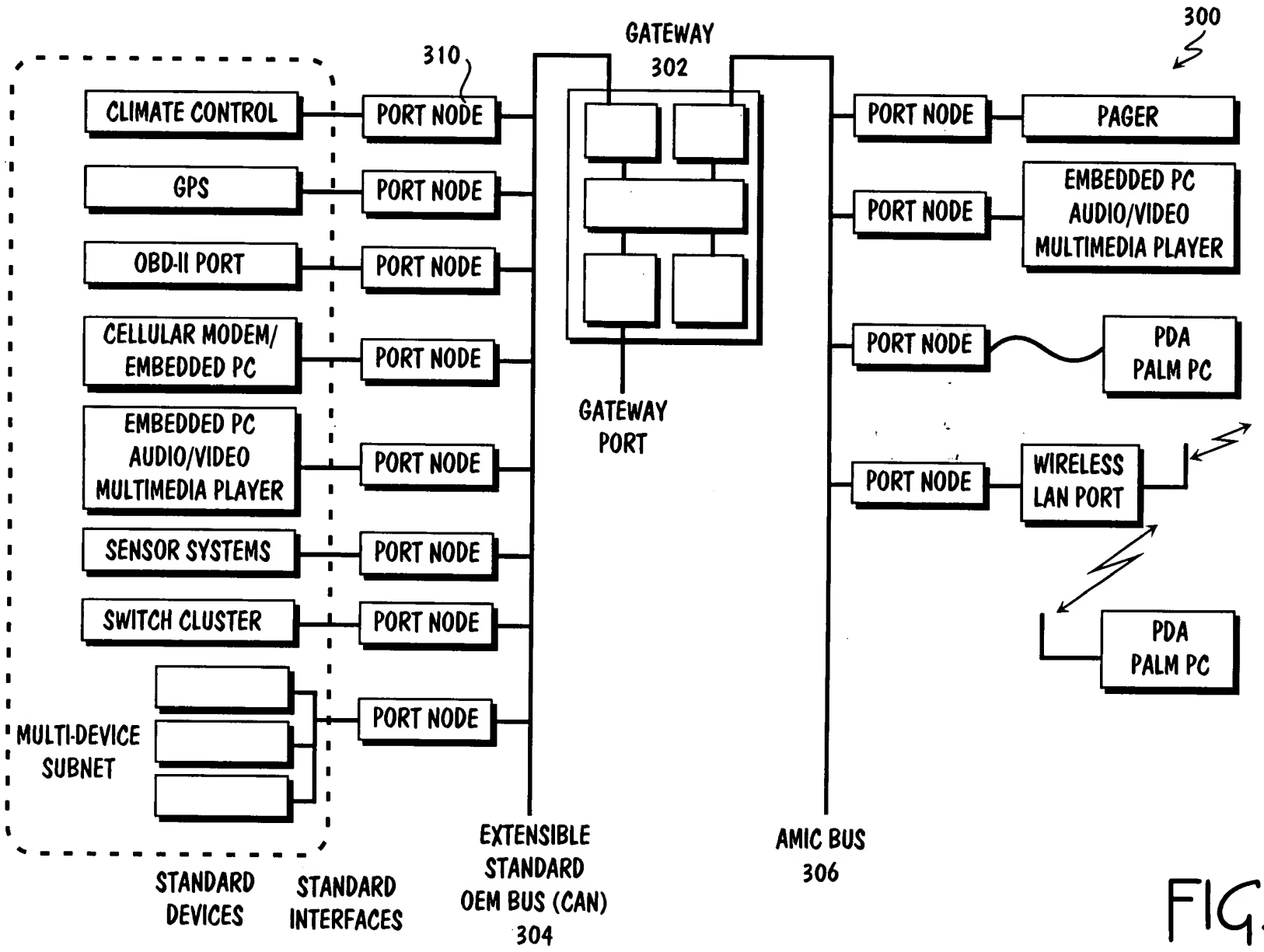

300
GATEWAY
302
310
CLIMATE CONTROL
GPS
OBD-II PORT
CELLULAR MODEM/
EMBEDDED PC
EMBEDDED PC
AUDIO/VIDEO
MULTIMEDIA PLAYER
SENSOR SYSTEMS
SWITCH CLUSTER
MULTI-DEVICE
SUBNET
PORT NODE
PORT NODE
PORT NODE
PORT NODE
PORT NODE
PORT NODE
PORT NODE
GATEWAY
PORT
PORT NODE
PAGER
PORT NODE
EMBEDDED PC
AUDIO/VIDEO
MULTIMEDIA PLAYER
PORT NODE
PDA
PALM PC
PORT NODE
WIRELESS
LAN PORT
PDA
PALM PC
STANDARD
DEVICES
STANDARD
INTERFACES
EXTENSIBLE
STANDARD
OEM BUS (CAN)
304
AMIC BUS
306

FIG. 3

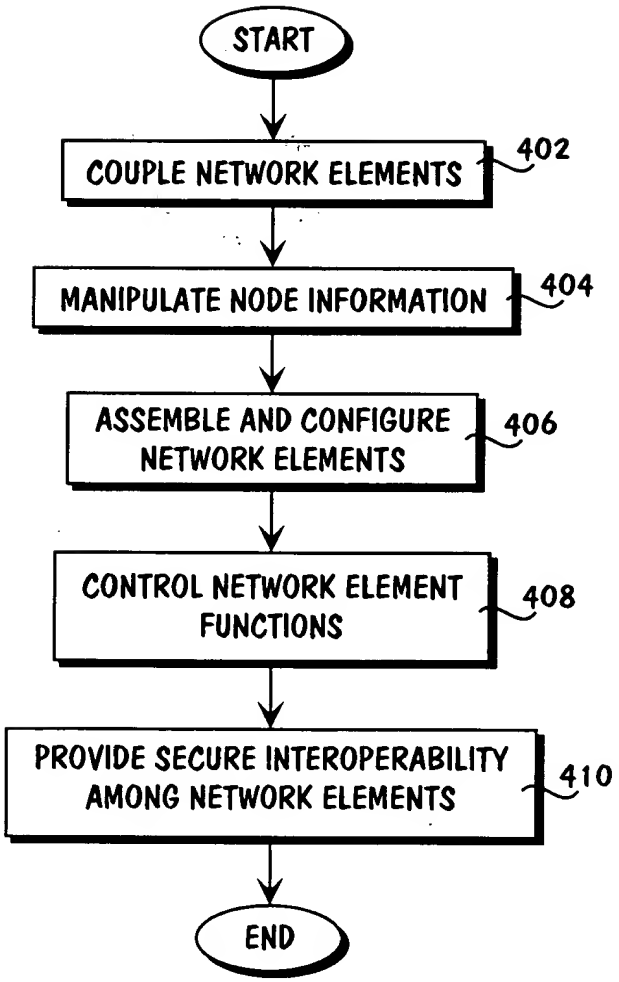
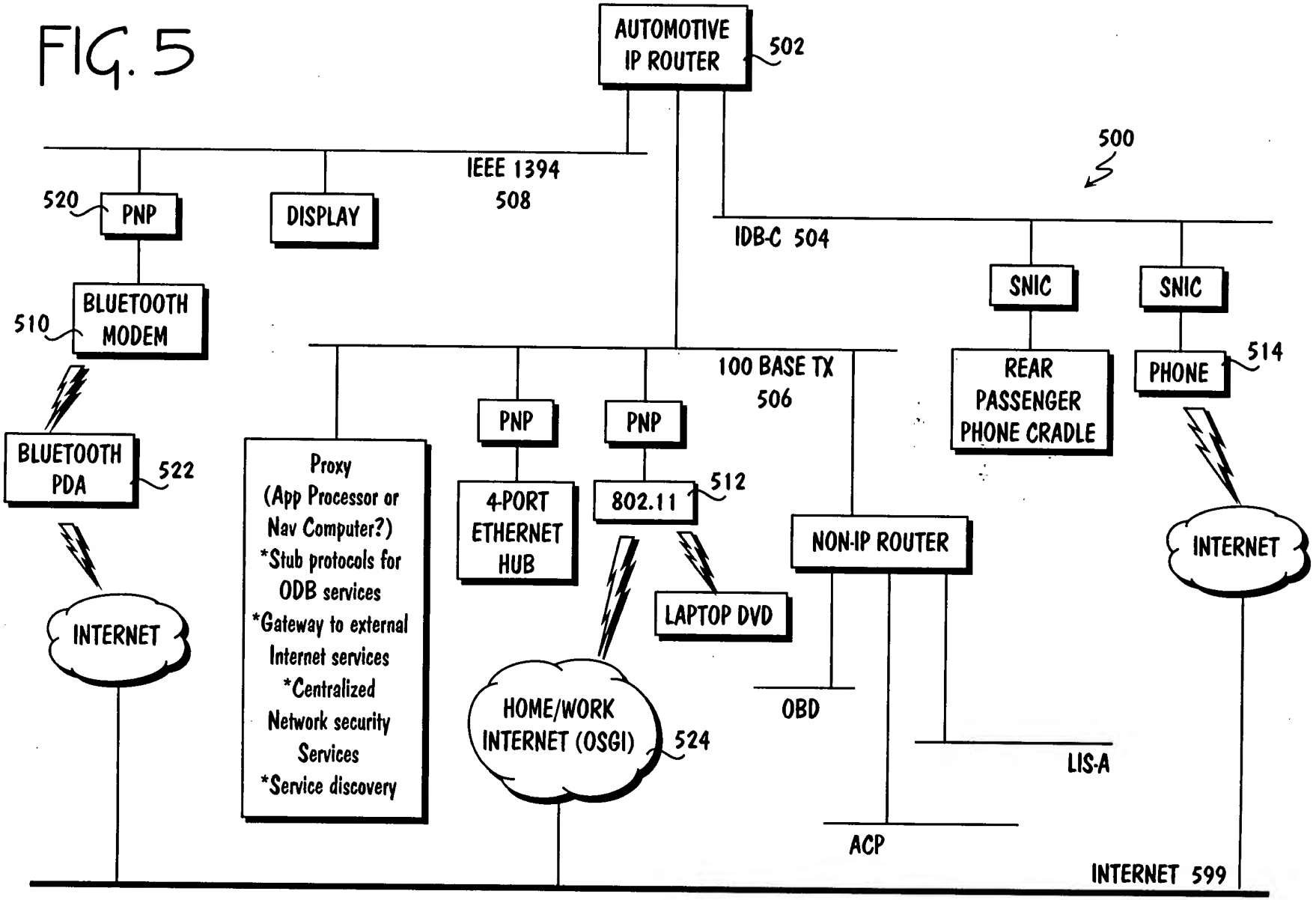

START
COUPLE NETWORK ELEMENTS
402
MANIPULATE NODE INFORMATION
404
ASSEMBLE AND CONFIGURE NETWORK ELEMENTS
406
CONTROL NETWORK ELEMENT FUNCTIONS
408
PROVIDE SECURE INTEROPERABILITY AMONG NETWORK ELEMENTS
410
END

FIG. 4

FIG. 5


AUTOMOTIVE IP ROUTER
502
500
IEEE 1394
508
520
PNP
DISPLAY
IDB-C 504
SNIC
SNIC
BLUETOOTH MODEM
510
100 BASE TX
506
REAR PASSENGER PHONE CRADLE
PHONE
514
PNP
PNP
BLUETOOTH PDA
522
Proxy
(App Processor or Nav Computer?)
*Stub protocols for ODB services
*Gateway to external Internet services
*Centralized Network security Services
*Service discovery
4-PORT ETHERNET HUB
802.11
512
NON-IP ROUTER
INTERNET
LAPTOP DVD
HOME/WORK INTERNET (OSGI)
524
OBD
LIS-A
ACP
INTERNET
INTERNET 599

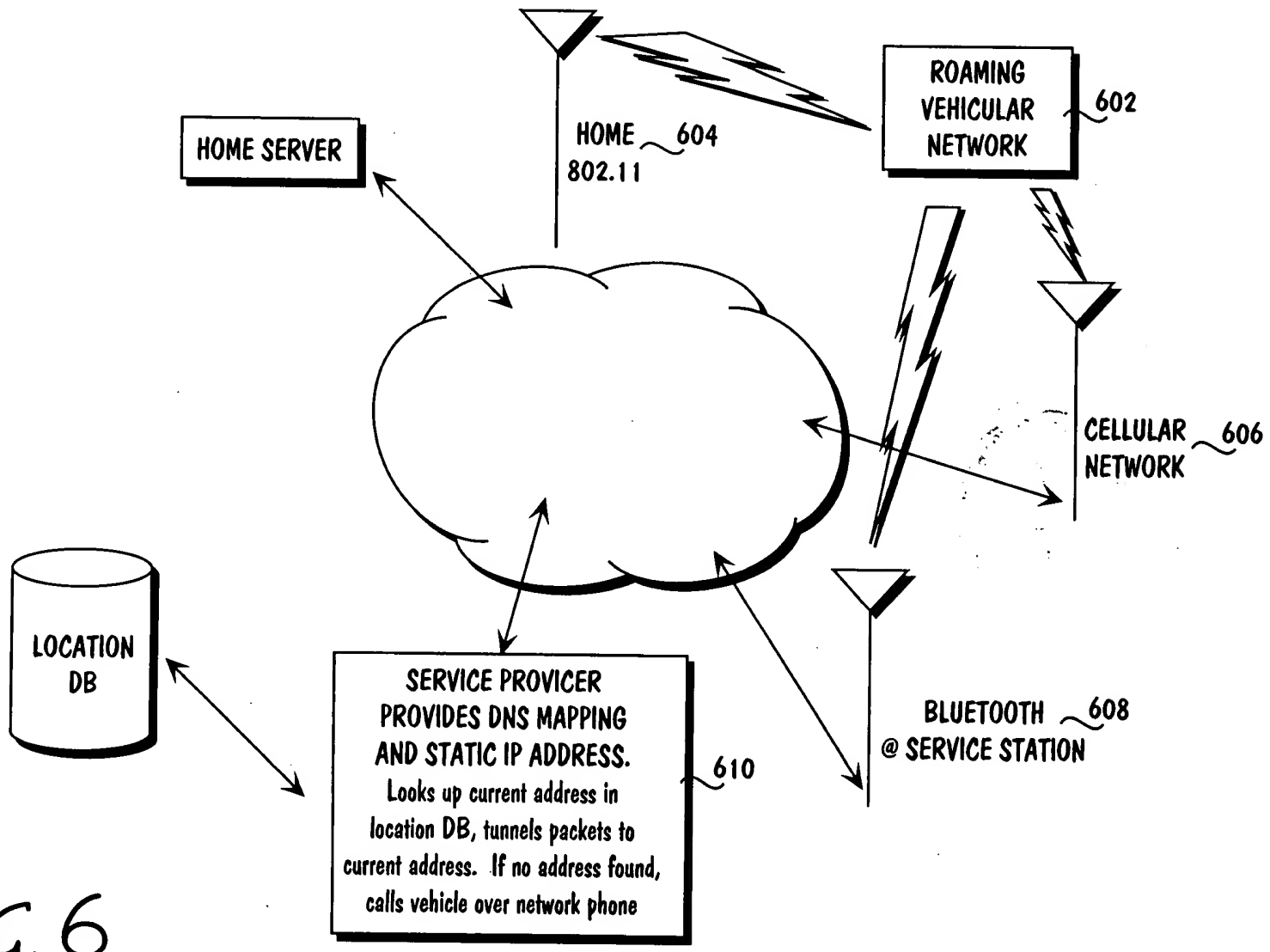

HOME SERVER
HOME 604
802.11
ROAMING VEHICULAR NETWORK 602
CELLULAR NETWORK 606
LOCATION DB
SERVICE PROVICER PROVIDES DNS MAPPING AND STATIC IP ADDRESS.
Looks up current address in location DB, tunnels packets to current address. If no address found, calls vehicle over network phone
610
BLUETOOTH 608
@ SERVICE STATION

FIG. 6

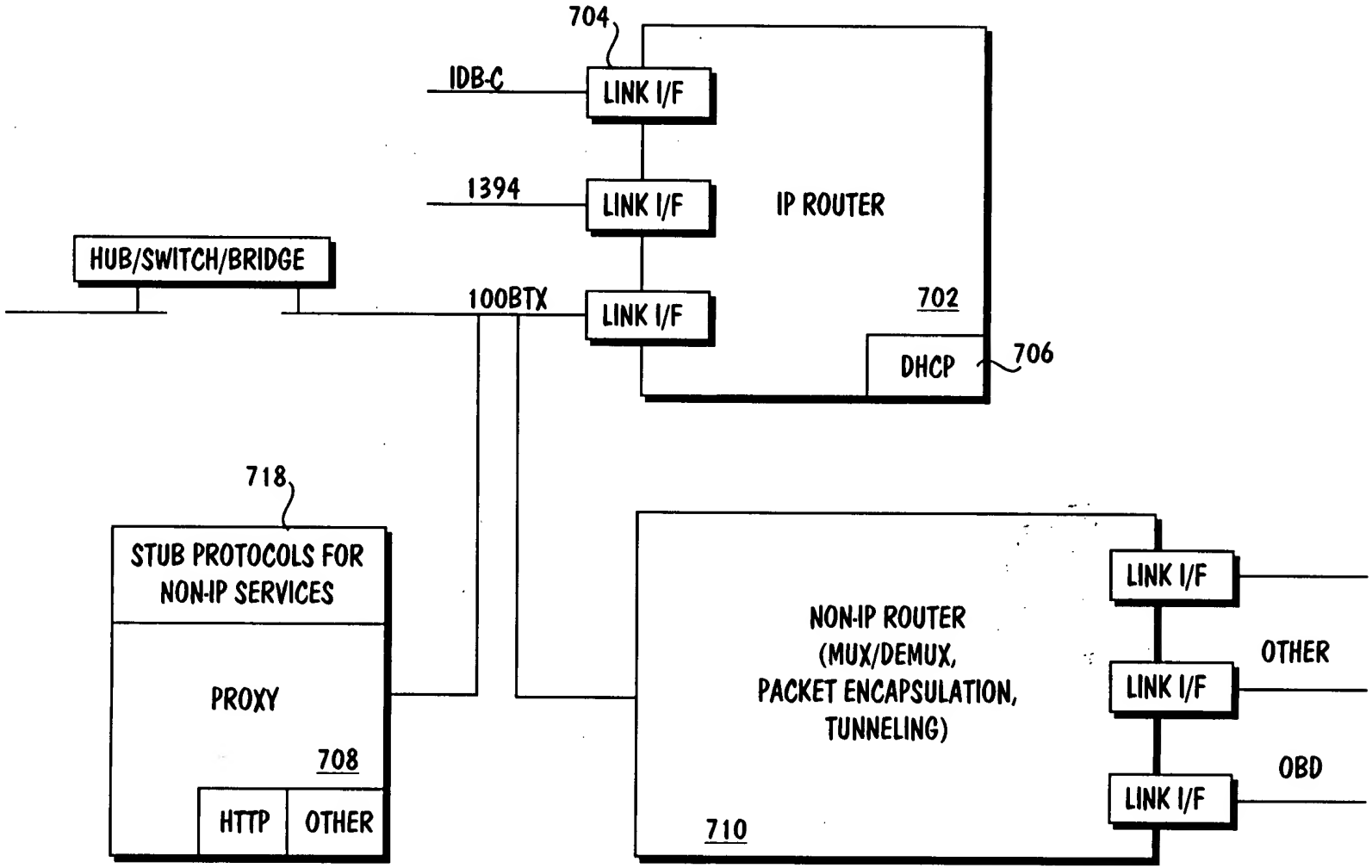

704
IDB-C
LINK I/F
1394
LINK I/F
IP ROUTER
HUB/SWITCH/BRIDGE
100BTX
LINK I/F
702
DHCP
706
718
STUB PROTOCOLS FOR NON-IP SERVICES
PROXY
708
HTTP
OTHER
NON-IP ROUTER (MUX/DEMUX, PACKET ENCAPSULATION, TUNNELING)
710
LINK I/F
OTHER
LINK I/F
OBD
LINK I/F

FIG. 7

FIG. 8

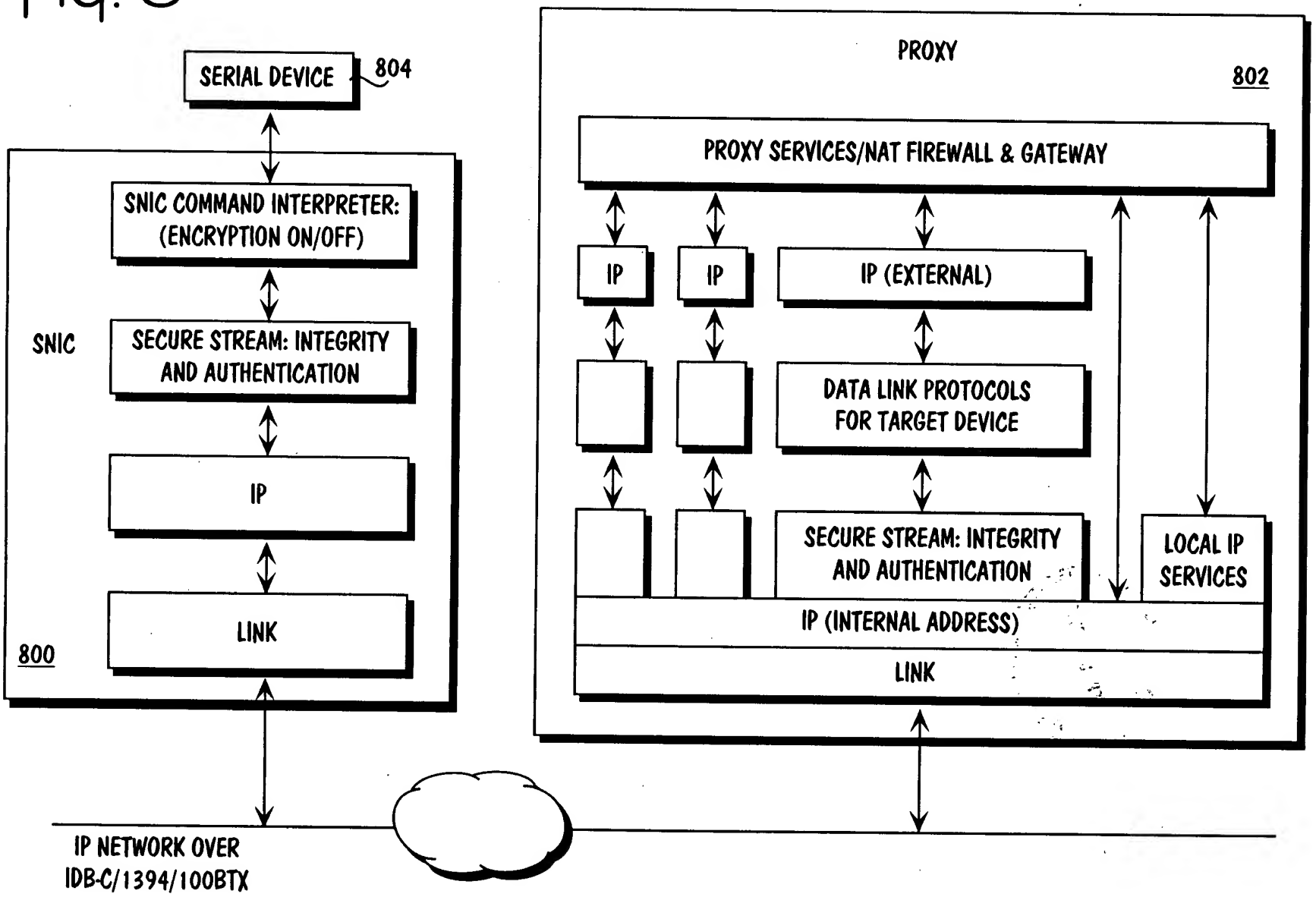
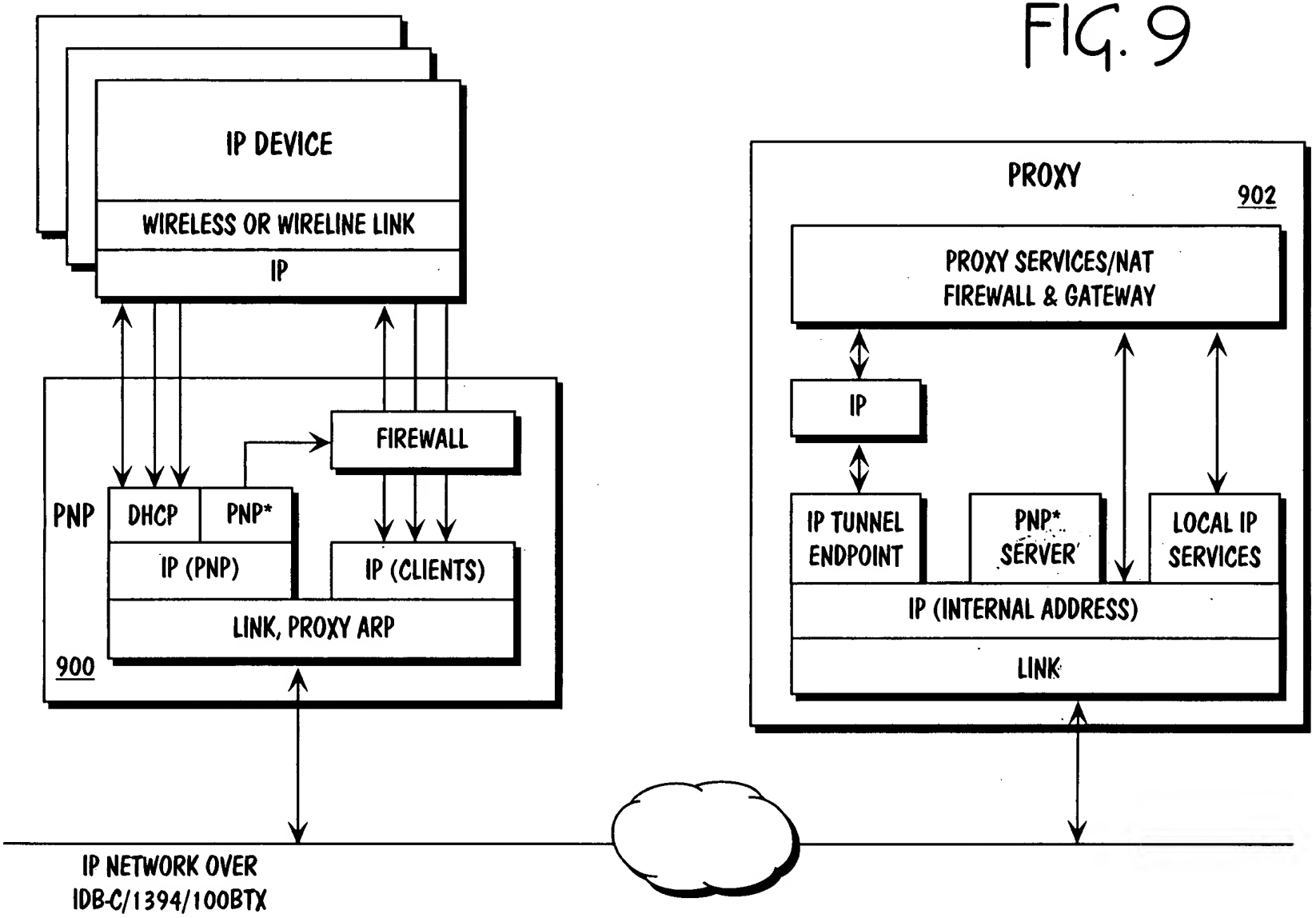

SERIAL DEVICE
804
SNIC COMMAND INTERPRETER: (ENCRYPTION ON/OFF)
SNIC
SECURE STREAM: INTEGRITY AND AUTHENTICATION
IP
LINK
800
PROXY
802
PROXY SERVICES/NAT FIREWALL & GATEWAY
IP
IP
IP (EXTERNAL)
DATA LINK PROTOCOLS FOR TARGET DEVICE
SECURE STREAM: INTEGRITY AND AUTHENTICATION
LOCAL IP SERVICES
IP (INTERNAL ADDRESS)
LINK
IP NETWORK OVER IDB-C/1394/100BTX

FIG. 9


IP DEVICE
WIRELESS OR WIRELINE LINK
IP
FIREWALL
PNP
DHCP
PNP*
IP (PNP)
IP (CLIENTS)
LINK, PROXY ARP
900
PROXY
902
PROXY SERVICES/NAT
FIREWALL & GATEWAY
IP
IP TUNNEL
ENDPOINT
PNP*
SERVER
LOCAL IP
SERVICES
IP (INTERNAL ADDRESS)
LINK
IP NETWORK OVER
IDB-C/1394/100BTX

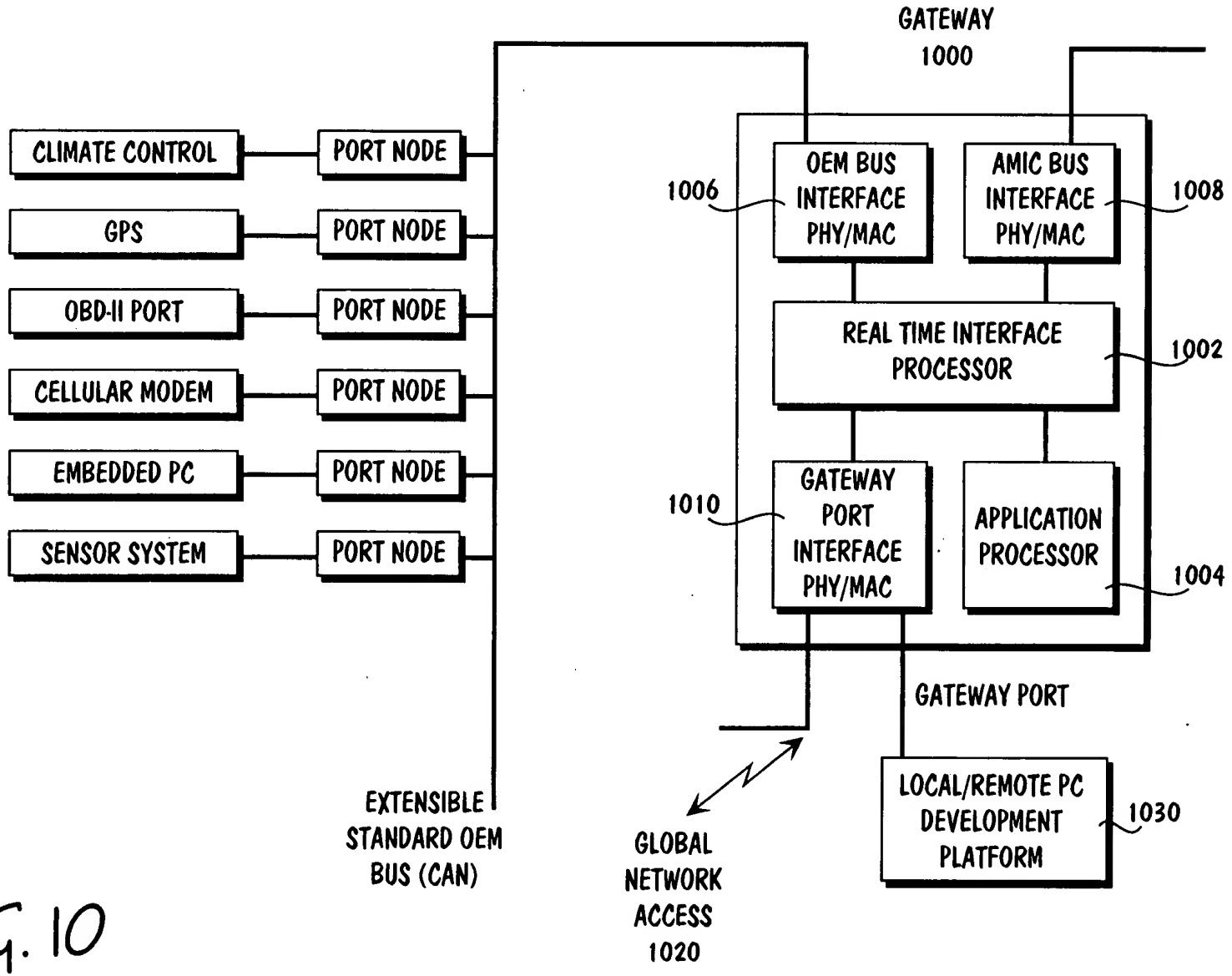

GATEWAY
1000
CLIMATE CONTROL
GPS
OBD-II PORT
CELLULAR MODEM
EMBEDDED PC
SENSOR SYSTEM
PORT NODE
PORT NODE
PORT NODE
PORT NODE
PORT NODE
PORT NODE
1006
OEM BUS INTERFACE PHY/MAC
AMIC BUS INTERFACE PHY/MAC
1008
REAL TIME INTERFACE PROCESSOR
1002
1010
GATEWAY PORT INTERFACE PHY/MAC
APPLICATION PROCESSOR
1004
GATEWAY PORT
EXTENSIBLE STANDARD OEM BUS (CAN)
GLOBAL NETWORK ACCESS 1020
LOCAL/REMOTE PC DEVELOPMENT PLATFORM
1030

FIG. 10

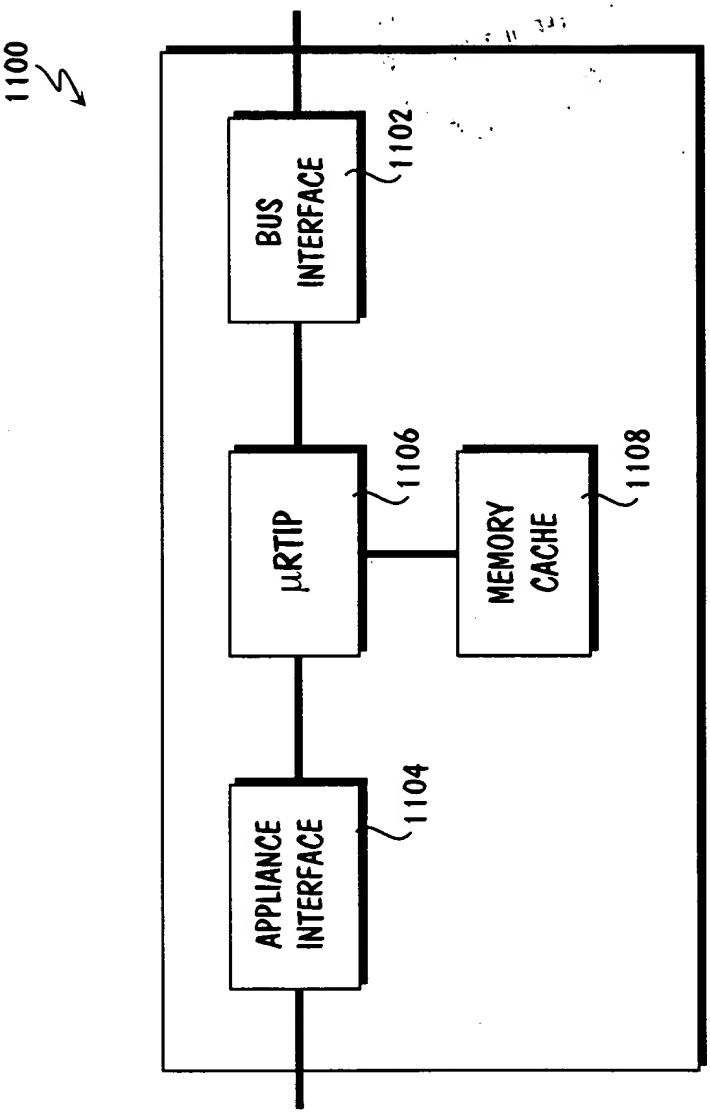

1100
BUS INTERFACE
1102
μRTIP
1106
MEMORY CACHE
1108
APPLIANCE INTERFACE
1104

FIG. 11

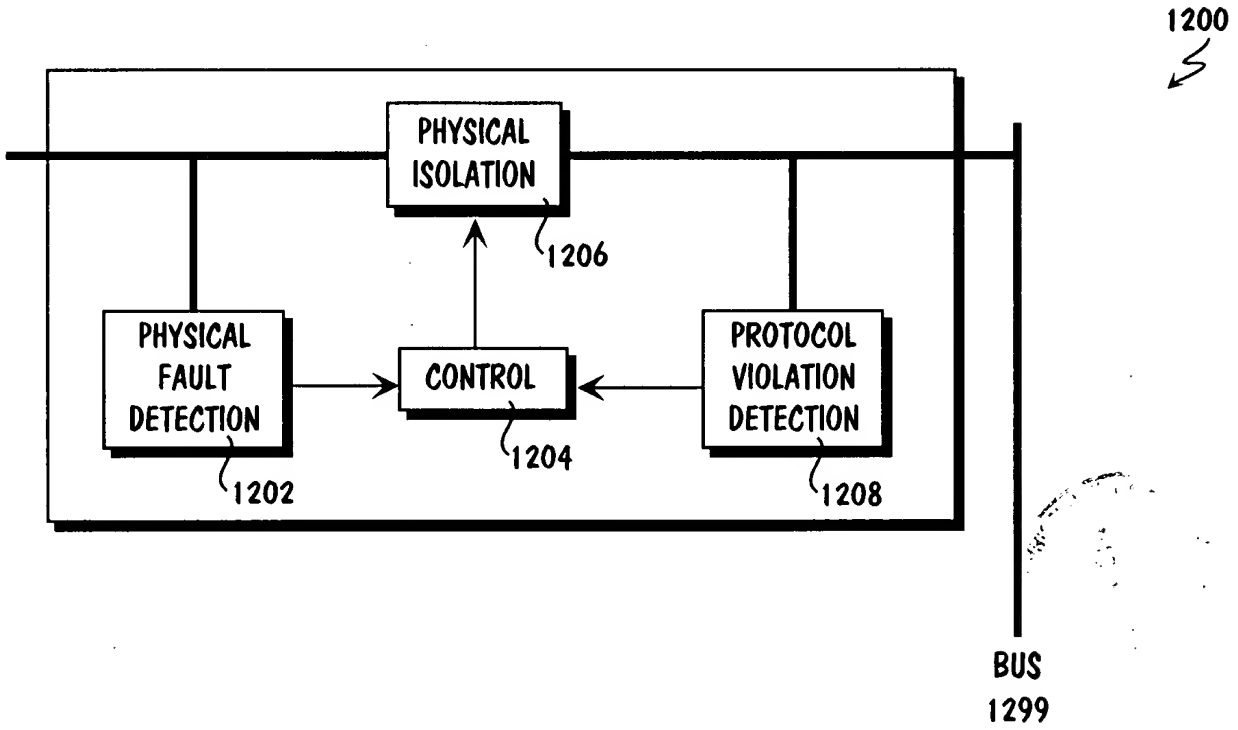

1200
PHYSICAL ISOLATION
1206
PHYSICAL FAULT DETECTION
1202
CONTROL
1204
PROTOCOL VIOLATION DETECTION
1208
BUS
1299

FIG. 12

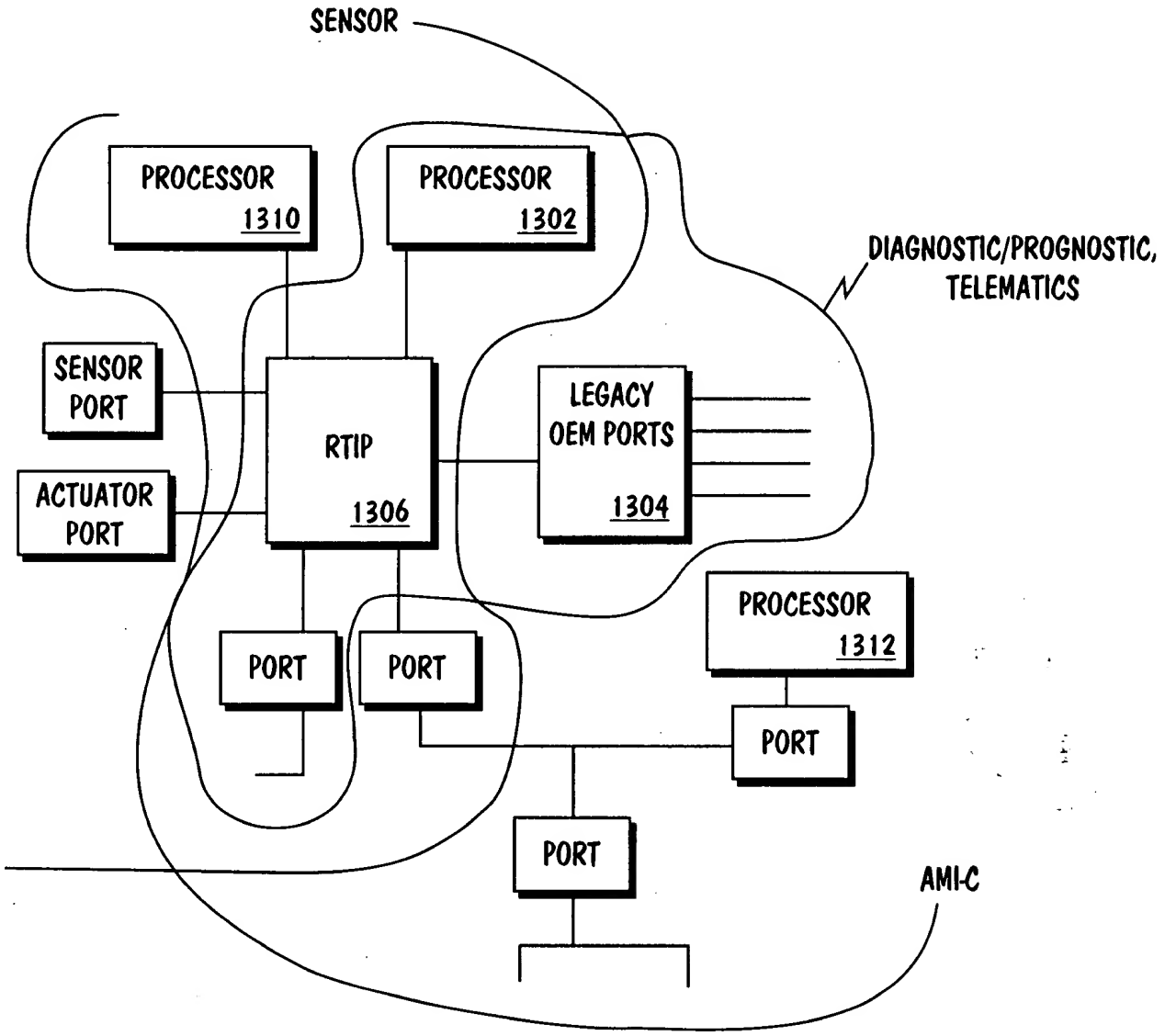

SENSOR
PROCESSOR
1310
PROCESSOR
1302
DIAGNOSTIC/PROGNOSTIC,
TELEMATICS
SENSOR
PORT
RTIP
1306
LEGACY
OEM PORTS
1304
ACTUATOR
PORT
PROCESSOR
1312
PORT
PORT
PORT
PORT
AMI-C

FIG. 13

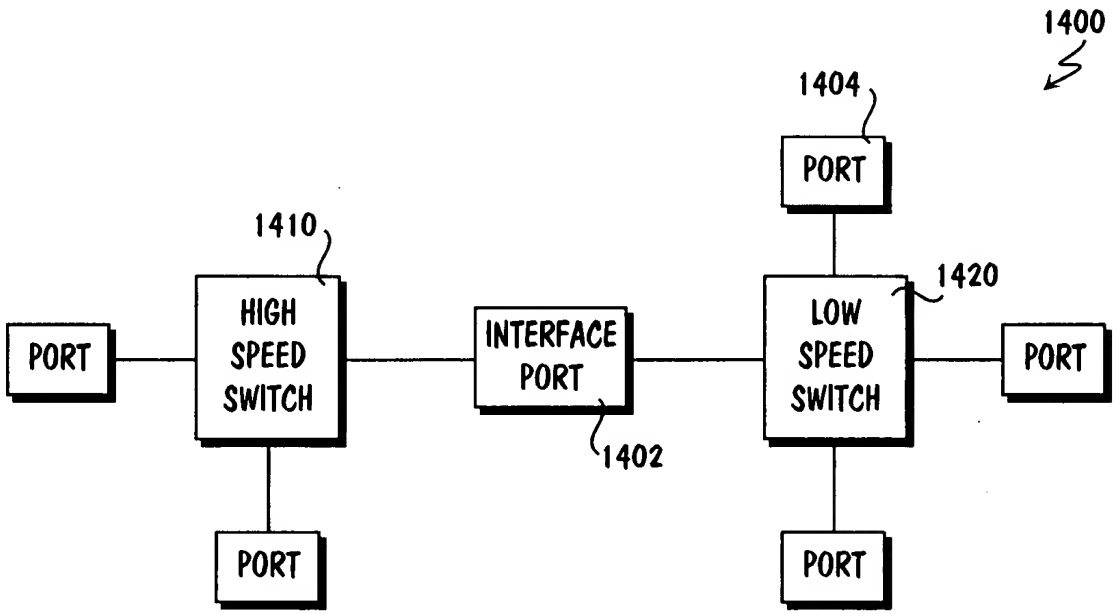

1400
1404
PORT
1410
1420
HIGH SPEED SWITCH
INTERFACE PORT
LOW SPEED SWITCH
PORT
PORT
1402
PORT
PORT

FIG. 14

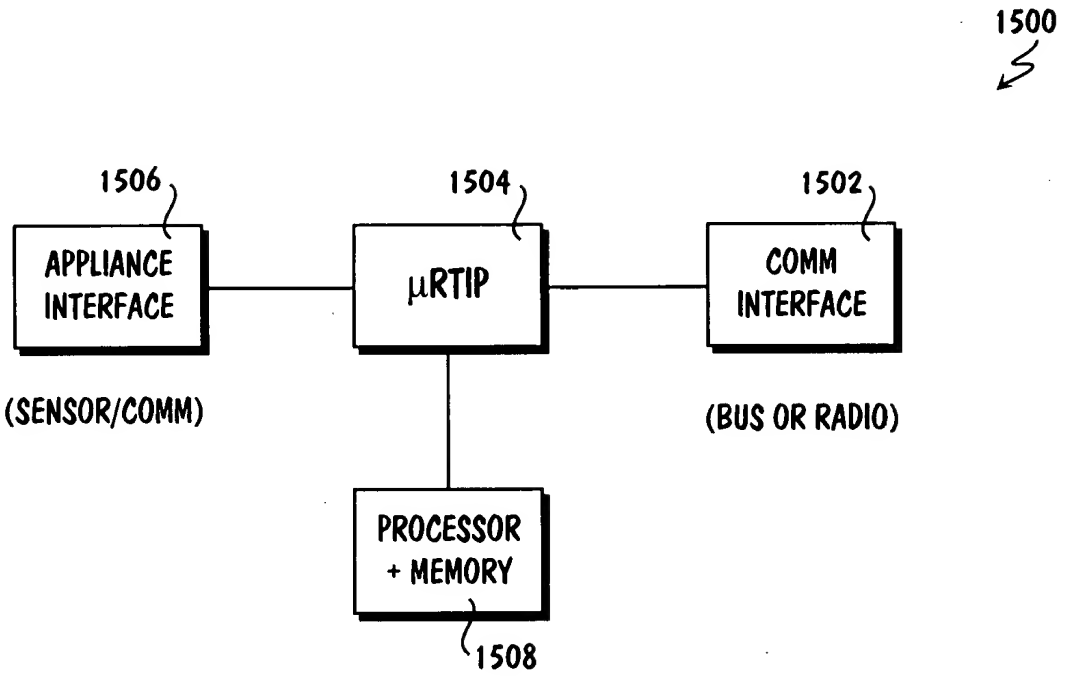

1500
1506
1504
1502
APPLIANCE INTERFACE
μRTIP
COMM INTERFACE
(SENSOR/COMM)
(BUS OR RADIO)
PROCESSOR + MEMORY
1508

FIG. 15

1600

SERVICES 1602	APPLICATION SUPPORT	DATABASE SERVICES	ROUTING	SECURITY	NETWORK MANAGEMENT	DEPLOYMENT
HOST 1604	GATEWAY	GATEWAY	GATEWAY	GATEWAY AND IPC NODES	GATEWAY AND IPC NODES	GATEWAY AND IPC NODES
API EXAMPLES 1606	• Diagnostics • Event Detection	• Network attributes • Device attributes • Diagnostic data	• Packet routing to • IDB-C • Bluetooth • IEEE 1394 • MOST • Internet	• User account management • Entry security • OEM bus access security • Internet access security • Authentication • Verification • Privacy	• Network status • SNMP services • IPC node access control	• Discovery • Initialization • Configuration

FIG. 16

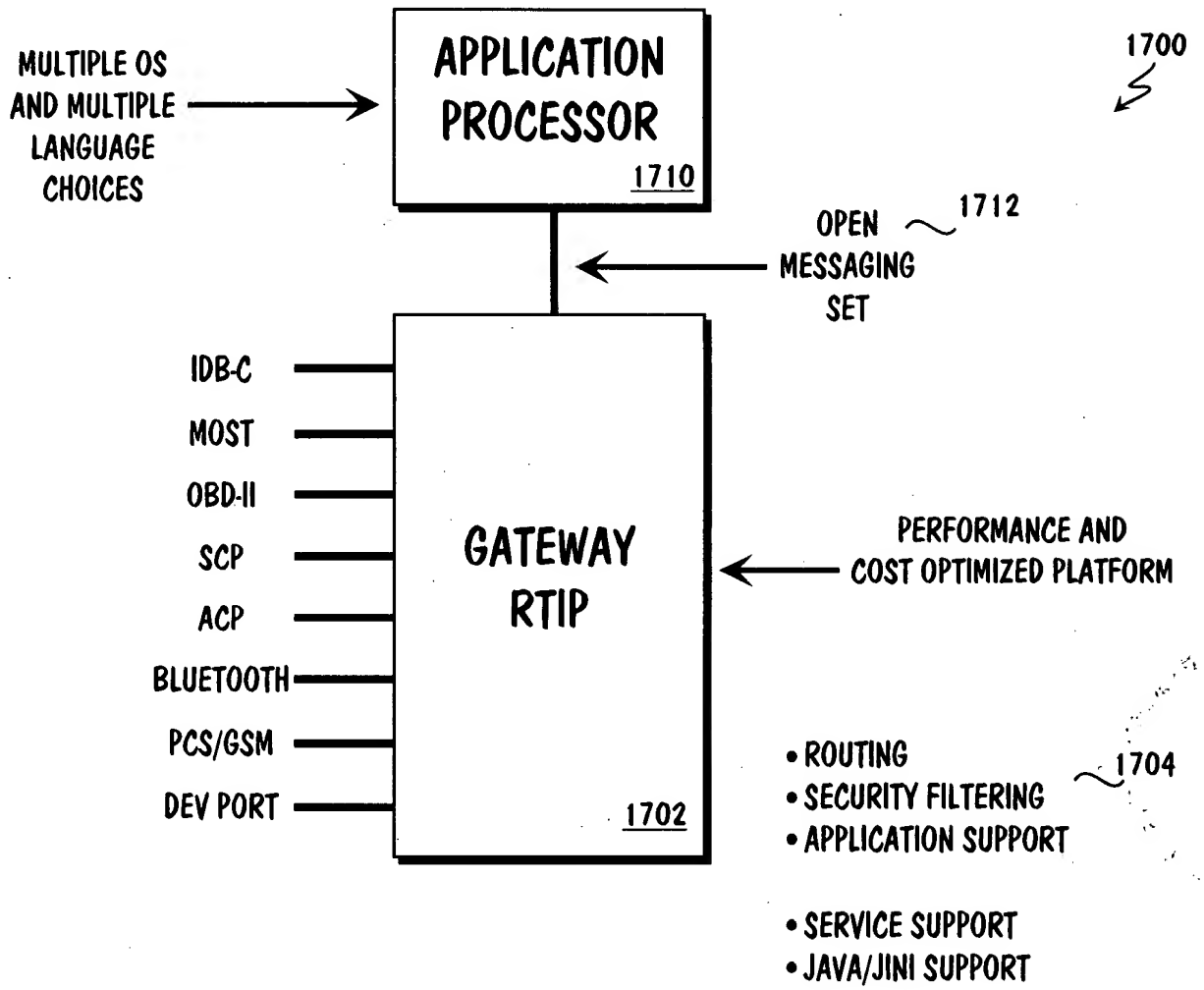

MULTIPLE OS AND MULTIPLE LANGUAGE CHOICES
APPLICATION PROCESSOR
1710
1700
OPEN MESSAGING SET
1712
IDB-C
MOST
OBD-II
SCP
ACP
BLUETOOTH
PCS/GSM
DEV PORT
GATEWAY RTIP
1702
PERFORMANCE AND COST OPTIMIZED PLATFORM
• ROUTING
• SECURITY FILTERING
• APPLICATION SUPPORT
1704
• SERVICE SUPPORT
• JAVA/JINI SUPPORT

FIG. 17

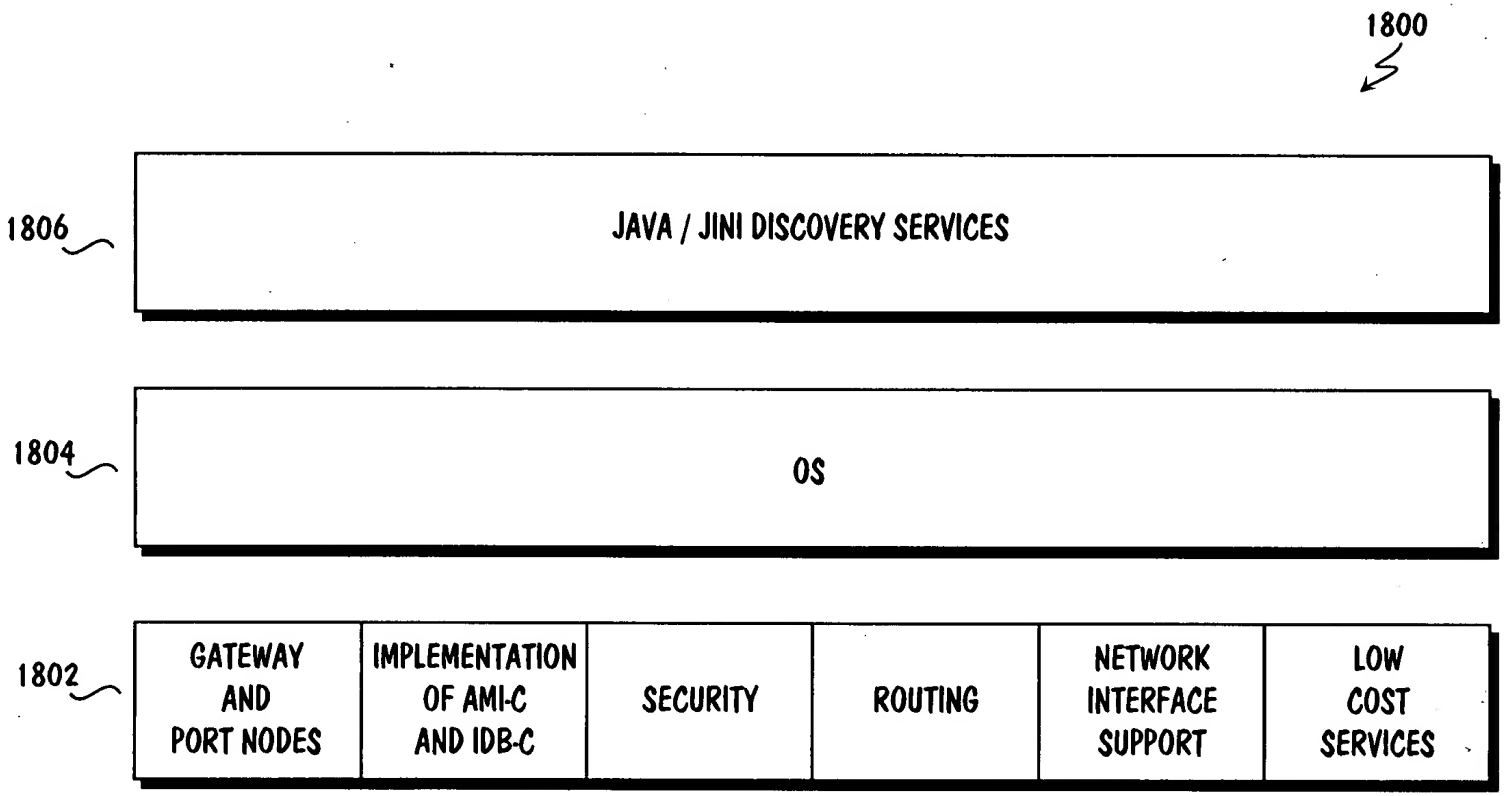

1800
1806
JAVA / JINI DISCOVERY SERVICES
1804
OS
1802
GATEWAY AND PORT NODES
IMPLEMENTATION OF AMI-C AND IDB-C
SECURITY
ROUTING
NETWORK INTERFACE SUPPORT
LOW COST SERVICES

FIG. 18

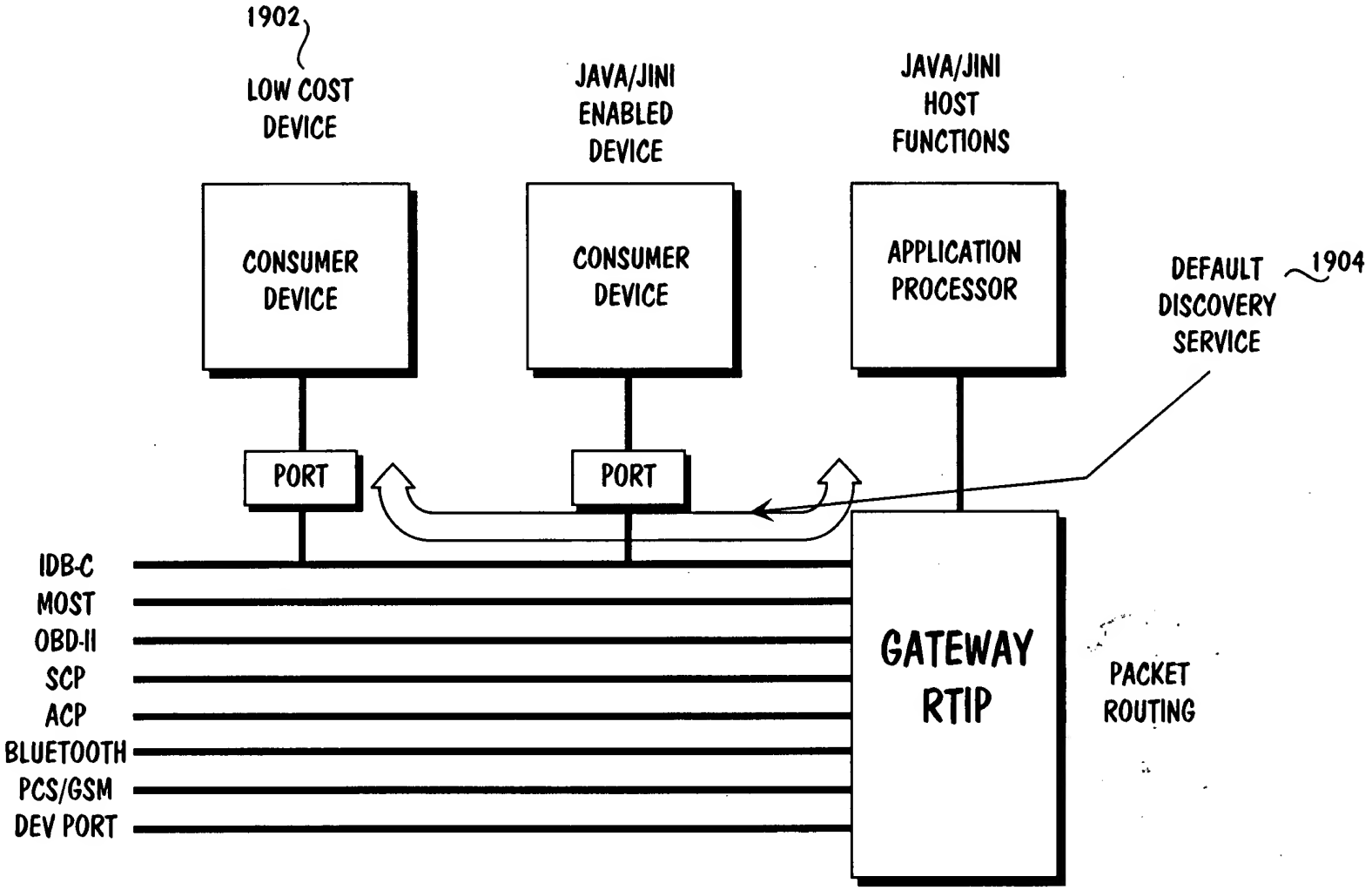

1902
LOW COST DEVICE
JAVA/JINI ENABLED DEVICE
JAVA/JINI HOST FUNCTIONS
CONSUMER DEVICE
CONSUMER DEVICE
APPLICATION PROCESSOR
DEFAULT DISCOVERY SERVICE
1904
PORT
PORT
IDB-C
MOST
OBD-II
SCP
ACP
BLUETOOTH
PCS/GSM
DEV PORT
GATEWAY RTIP
PACKET ROUTING

FIG. 19

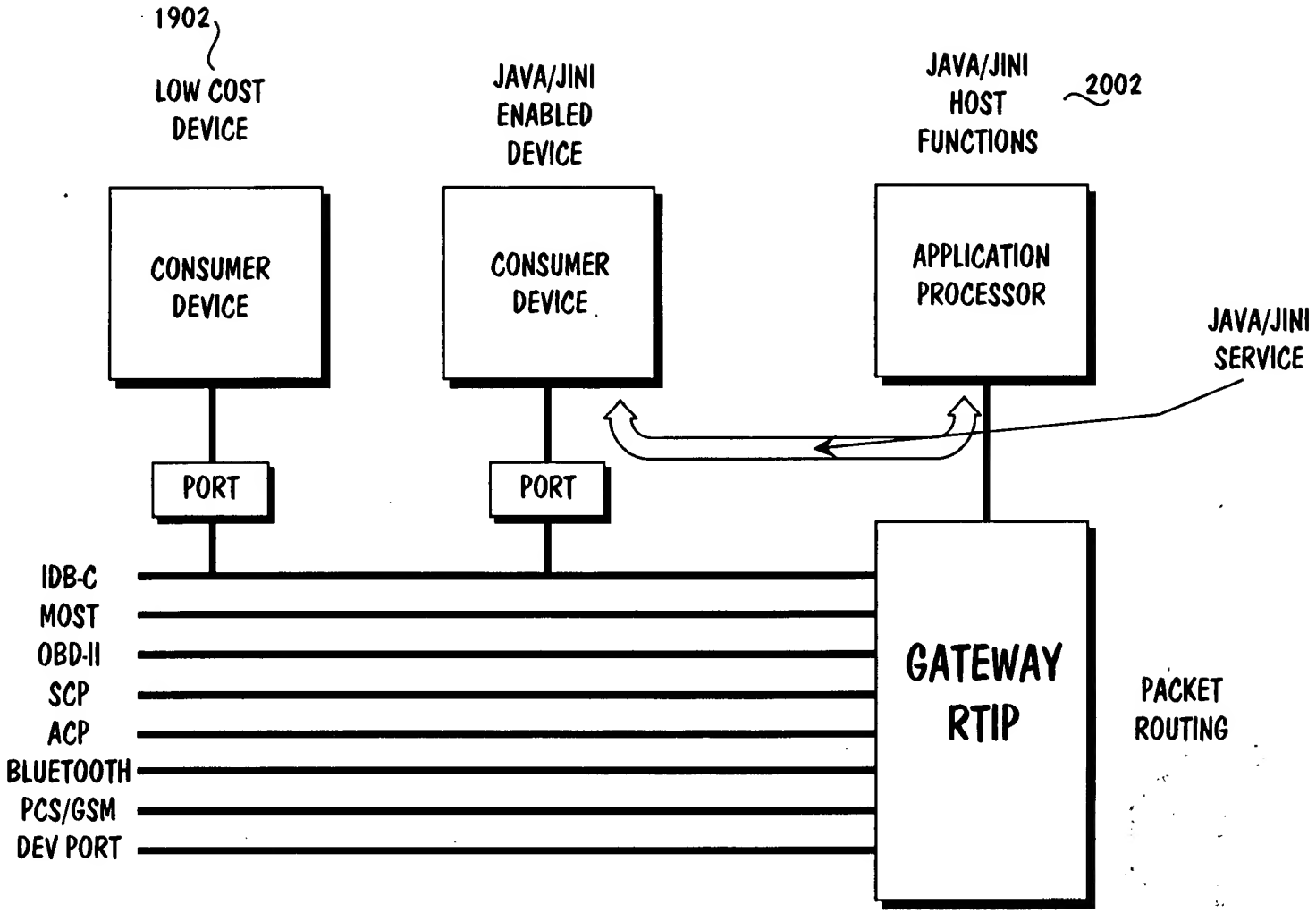

1902
LOW COST DEVICE
JAVA/JINI ENABLED DEVICE
JAVA/JINI HOST FUNCTIONS
2002
CONSUMER DEVICE
CONSUMER DEVICE
APPLICATION PROCESSOR
JAVA/JINI SERVICE
PORT
PORT
IDB-C
MOST
OBD-II
SCP
ACP
BLUETOOTH
PCS/GSM
DEV PORT
GATEWAY RTIP
PACKET ROUTING

FIG. 20

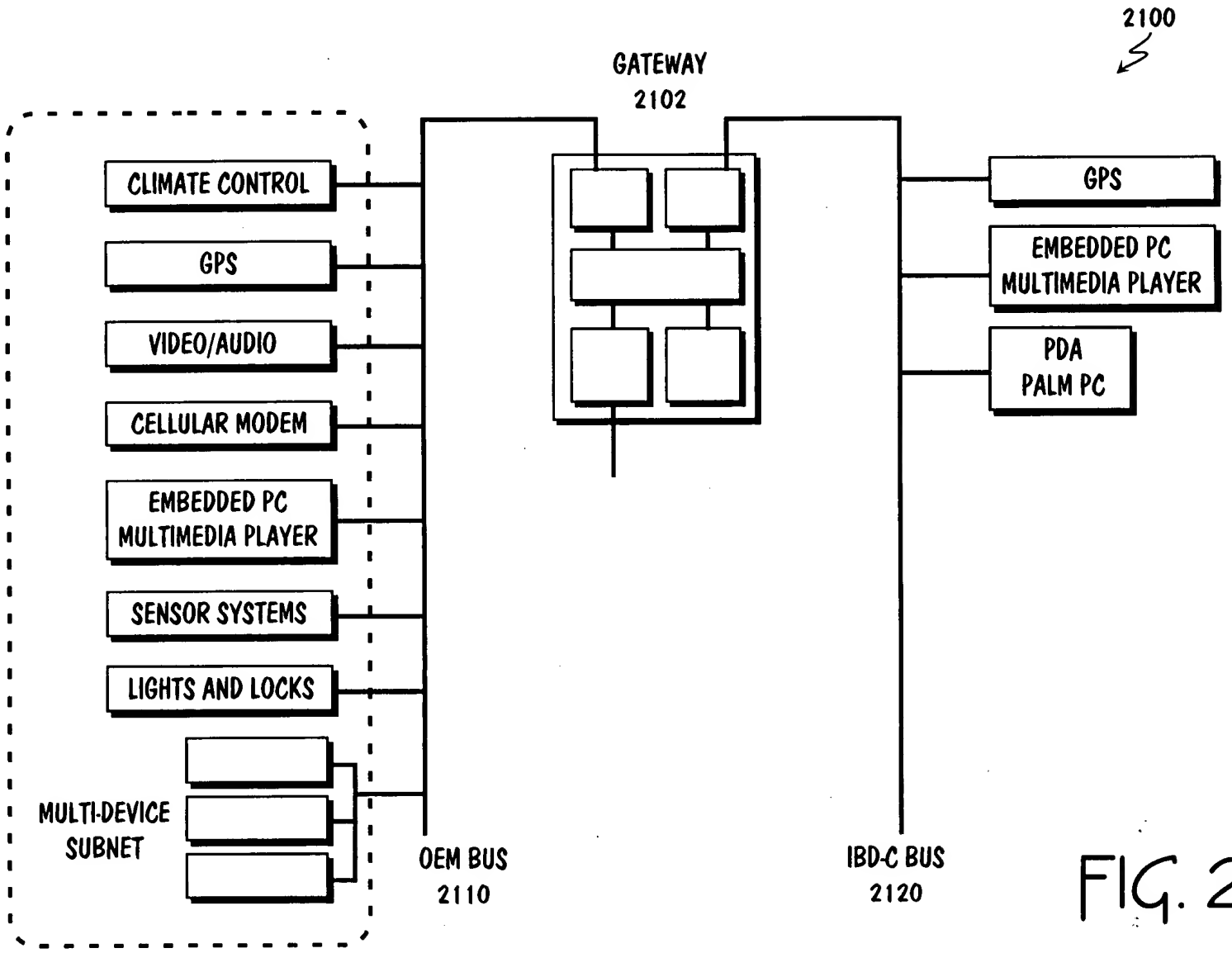

2100
GATEWAY
2102
CLIMATE CONTROL
GPS
VIDEO/AUDIO
CELLULAR MODEM
EMBEDDED PC
MULTIMEDIA PLAYER
SENSOR SYSTEMS
LIGHTS AND LOCKS
MULTI-DEVICE
SUBNET
OEM BUS
2110
GPS
EMBEDDED PC
MULTIMEDIA PLAYER
PDA
PALM PC
IBD-C BUS
2120

FIG. 21

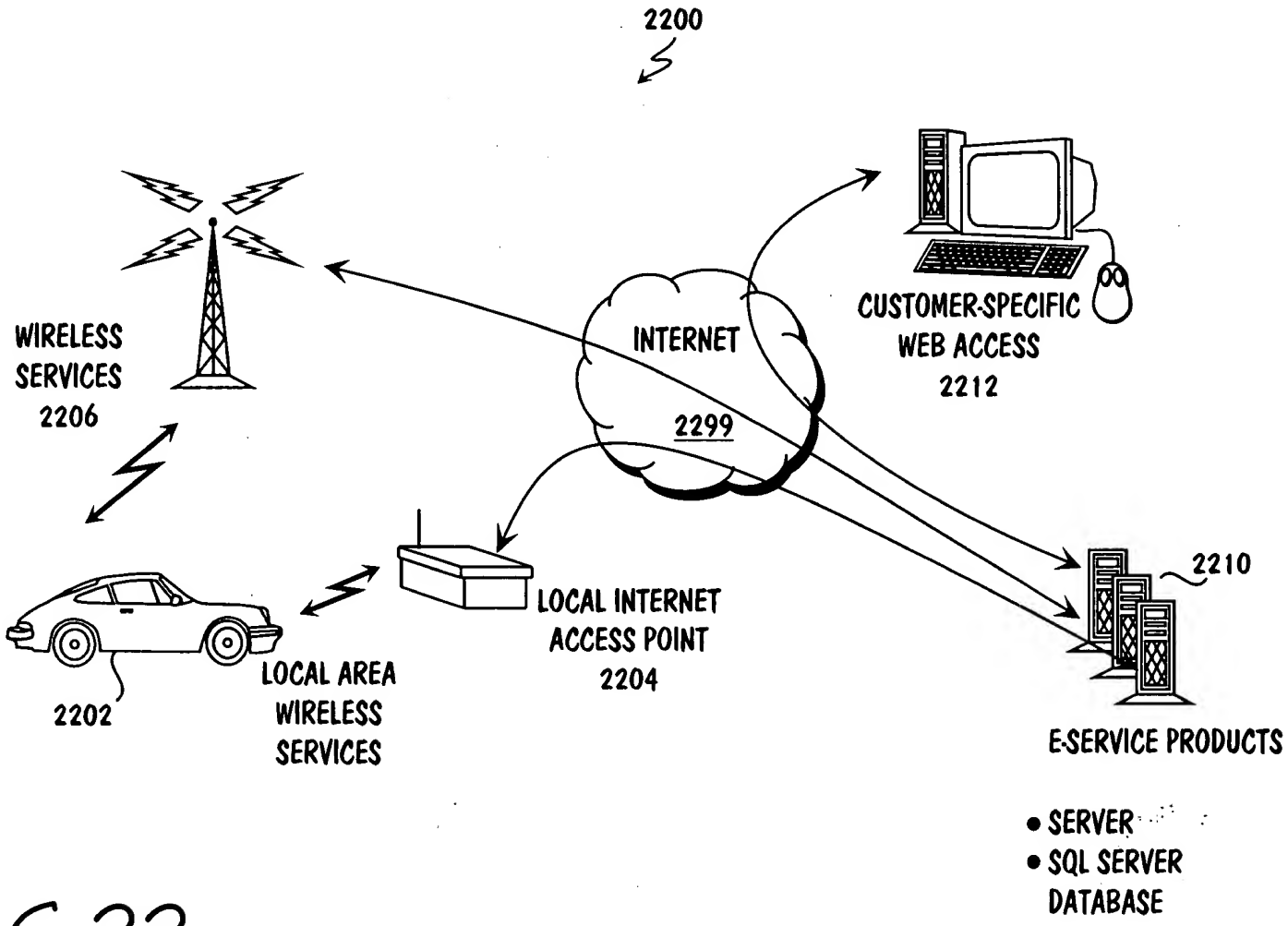

2200
WIRELESS SERVICES 2206
INTERNET
2299
CUSTOMER-SPECIFIC WEB ACCESS 2212
LOCAL INTERNET ACCESS POINT 2204
2210
2202
LOCAL AREA WIRELESS SERVICES
E-SERVICE PRODUCTS
• SERVER
• SQL SERVER DATABASE

FIG. 22

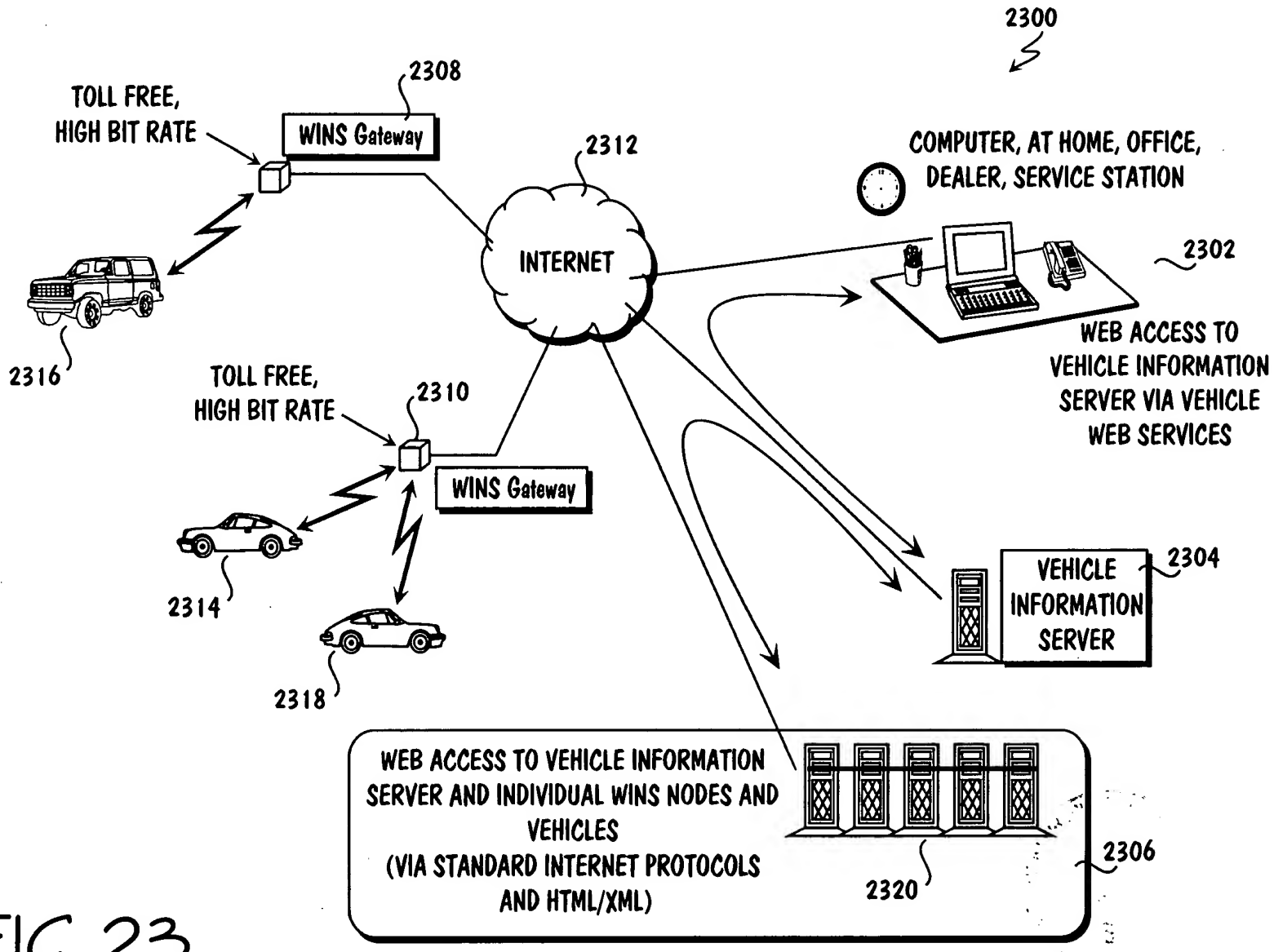

2300
TOLL FREE,
HIGH BIT RATE
2308
WINS Gateway
2312
INTERNET
COMPUTER, AT HOME, OFFICE,
DEALER, SERVICE STATION
2302
WEB ACCESS TO
VEHICLE INFORMATION
SERVER VIA VEHICLE
WEB SERVICES
2316
TOLL FREE,
HIGH BIT RATE
2310
WINS Gateway
2314
2318
VEHICLE
INFORMATION
SERVER
2304
WEB ACCESS TO VEHICLE INFORMATION
SERVER AND INDIVIDUAL WINS NODES AND
VEHICLES
(VIA STANDARD INTERNET PROTOCOLS
AND HTML/XML)
2320
2306

FIG. 23